Approved Minutes of the IHRA Steering Committee

Sunday, May 31, 1998
Port of Windsor Room
Clery Conference Center
Windsor, Ontario, Canada

Attendees:

Australia	Keith Seyer
	Peter Makeham
Belgium EC(DG III)	Herbert Henssler
Canada	Ian Noy
	Brian Jonah
	Dainius Dalmotas
France	Jean-Pierre Medevielle
Germany/EEVC	Bernd Friedel
Italy	Claudio Lomonaco
Japan	Kazuyoshi Matsumoto
	Yoshyuki Mizuno
Netherlands	Gerard Meekel
Poland	Wojciech Przybylski
Sweden	Kåre Rumar
United Kingdom	Keith Rodgers
	Peter O'Reilly
	Richard Lowne
United States	Raymond Owings
	Joseph Kanianthra
	John Hinch
	Julie Abraham
	Donna Gilmore
	Linda O'Connor

Agenda Items:

Review of Last Meeting Minutes
Side Impact
Review of IHRA Status Reports
Collaborative Research
Development of Web Site for IHRA
Industry Participation
New Members/Next Meeting

Welcome:

Dr. Raymond P. Owings, Associate Administrator, Research and Development, NHTSA, United States called the meeting to order. Dr. Owings thanked Canada for having the meeting in their country. He also gave a special "Thank You" to Linda O'Connor, IHRA secretariat - retiring, for her help.

He introduced Donna Gilmore, who will be the new ESV secretariat and John Hinch, who will be the new IHRA secretariat. Dr. Owings discussed the 5 year effort of IHRA and expressed his commitment for a productive next 3 years of research, also indicating his expectation that IHRA would continue past the initial 5-year effort.

Last Meeting Minutes:

Ms. O'Connor reviewed the November 1997, minutes with the committee. Comments had been received, and Ms. O'Connor reported that she had made changes to reflect those comments. She also reported that a letter was sent to Mr. Phelps, OICA, responding to his request about industry participation in IHRA.

Side Impact:

Dr. Owings introduced the topic for discussion and invited several representatives to discuss their positions regarding Side Impact. Dr. Friedel, Mr. Makeham, Mr. Meekel, Dr. Noy, and Mr. Matsumoto gave their countries' positions regarding the formation of a new Side Impact Working Group. Proposals included formation of a new group, combining the Side Impact dummy development with the efforts of the biomechanics working group, and combinations and variations of

these proposals. EEVC suggested that the activities of the working group should be closely coordinated with ISO activities on the side impact dummy and the IHRA should lead the side impact and dummy development research activities. Generally, the group agreed that two tasks needed to be preformed, 1) biomechanics work to support an improved side impact dummy, and 2) side impact research into the test procedures development for conducting side crash evaluations. Several members indicated to keep-in-mind the research required to meet both short-term and long-term needs in planning the IHRA activities.

After a lively discussion (which included most members of the steering group) on development of a side impact working group, a recommendation was made for consideration. It consisted of three items: 1) Set up an ad-hoc group within the biomechanics working group, comprised of government members only, to write a prospective on the status of knowledge on biomechanics of side impact and the status of the development of side impact dummies. A schedule of 6 months for an interim report and 12 to 18 months for a final report was agreed upon; 2) Provide a clear directive to the IHRA biomechanics working group that the above item is a short term effort and will not affect the long term goals; and 3) create a side impact working group whose activities are closely coordinated with the biomechanics and compatibility working groups modeled after the working relationship between the biomechanics working group and the offset frontal working group. It was also agree that research related to functional equivalence of existing regulation is outside the scope of the IHRA side impact activities.

Dr. Kanianthra and several other IHRA steering group members drafted the mission statement for the biomechanics group for the conduct of item 1. A copy of this draft document is found as Attachment 1.

While the Steering Committee members from France and Italy did not commit on the development of the Side Impact IHRA activities on item 3 of the recommendation made for consideration, the Steering Committee agreed that it was definitely created, that Australia should lead the working group for side impact under IHRA, the work will be closely coordinated with the biomechanics working group activities, and a draft mandate will be proposed during the November 1998 meeting.

Status Reports

The IHRA status reports were discussed by each working group chairman. Generally, the reports were short, because their full status report would be delivered at the ESV technical sessions later in the week. Additionally, copies of the draft status reports had been circulated to each member just prior to the meeting. The following are some highlights from each chairperson.

Pedestrian

Mr. Matsumoto (Japan) reviewed the pedestrian working group efforts to date. He presented a document detailing the status of his working group. A copy is attached as Attachment 2.

ITS

Mr. Noy (Canada) reviewed the progress by the working group on Intelligent Transportation Systems (ITS). So as not to conflict with other non-IHRA group's efforts, IHRA's ITS working group is developing a framework for evaluation of ITS countermeasures. Workshops are being held as part of this effort. They are also developing a database of relevant ITS research.

During the discussion of ITS working group status report, two items were brought up which required action. Ian Noy reported that the issue concerning EC research framework was raised at the IHRA Steering Committee since many EC funded projects

are closed to non-European parties. Such a policy in Europe appears to be an impediment to international collaboration in research. This is particularly problematic for the ITS WG since most European ITS-related research is funded by the EC.
1) The Steering Committee decided that Ray Owings, Chairman, will write a letter to EC DG 7, DG 12, DG 13 (DG 3) to outline the problem and invite the EC to explore how collaboration on priority research topics through IHRA and other fora can be facilitated. The letter should seek to identify the main groups conducting the research programs, areas of commonality mechanisms for cooperation, how results can be shared, and the institutes or investigation centers that are involved.
2) The IHRA Steering Committee also noted that similar letters should be sent to ministers of transport in each country, possibly from the Secretary of Transportation.

Vehicle Compatibility

Mr. Rodgers (UK) presented a short discussion on vehicle compatibility. Their working group has held 3 meetings. They are waiting for a letter from OICA to identify the members representing the industry for participation in their working group.

Biomechanics

Dr. Kanianthra (US) presented the status of biomechanics. He said that Side Impact dominated the agenda at their Orlando, FL meeting. He also discussed the efforts in dummy development in different regions and the needs of North America.

Offset Frontal

Mr. Lomonaco (Italy) indicated that there was a correction to his status report. At the top of Column 2, Page 1, item 1 should be deleted.

Collaborative Research

Dr. Noy suggested that the IHRA steering group send formal letters to DG-7, DG-12, and DG-13 to indicate methods of collaborative research. It was suggested that the letters be coordinated by Dr. Owings.

Development of Web Site for IHRA

Mr. Hinch suggested that IHRA set up a permanent web site for distributing IHRA material. The steering group was in agreement and the United States agreed to take the lead. Mr. Hinch will assemble information for the web, the following are proposed for inclusion:

1) Names, addresses, and phone numbers of the steering group members and all working groups. Each steering group member was asked to supply a photograph for inclusion in the web site.
2) By-laws developed in Melbourne.
3) History of IHRA.
4) Minutes from the steering group meetings, after they are approved by the steering group.
5) Minutes from the working group meetings, after they are approved by the steering group.
6) A schedule of upcoming events for all IHRA related activities.
7) Copies of the IHRA status reports of various working groups by the respective chairman.

Other members were invited to submit additional information for the web site.

Industry Participation

A short discussion was held reflecting the fact that IHRA had not received the list of industry participants for the working groups from OICA. During the ESV meeting, Mr. Phelps presented NHTSA with a copy of the industry nominations for the 5 working groups established in Melbourne. Mr. Hinch distributed this list at the ESV luncheon. A copy is also attached as item 3.

ISO Introduction Letter

It was agreed by the Steering Committee that NHTSA should draft a letter of introduction between

the New Side Impact Working Group and the ISO committee working on Side Impact standards.

New Members

Several members are retiring. These include:
Keith Rodgers
Peter Makeham
Kåre Rumar
A "Thank You" to all was expressed by the steering group members.

Mr. Rodgers reported that Peter O'Reilly would be his replacement representing U.K. Mr. Rumar indicated that Andres Lie will assume the responsibilities in IHRA on behalf of Sweden. Other new members will be formally assigned in the near future as they are named by their respective countries.

Next Meeting

It was agreed the next Steering Committee meeting will be held in Geneva on November 13, 1998.

Prepared by: John Hinch, IHRA Secretariat
Date: August 20, 1998
Edited per Steering Committee Approval
Date: November 30, 1998

End of Report

Attachment 1 - Side Impact Mission Statement for Part 1 of the proposed side impact initiative.

Attachment 2 - Mr. Matsumoto's written statement on the pedestrian working group.

Attachment 3 - OICA industry participants list for IHRA working groups

ESV/IHRA PROJECT

PEDESTRIAN SAFETY

Status Report

Ministry of Transport, Japan

June, 1998

The ESV/IHRA Project was introduced at the ESV held in Melbourne, May 1996. Also at the Meeting, the leading country of the project were announced, whereby Japan was assigned the leading country for the research item of PEDESTRIAN SAFETY. Japan, in response, requested ESV member countries to select their experts in pedestrian safety, and has been carrying out the assigned work with the selected experts assuming the central research role. Below is a summary of these activities.

1. Task Assigned to IHRA/Pedestrian Safety

   The task of IHRA/Pedestrian Safety is to propose harmonized test procedures and its requirements which will contribute to a reduction of pedestrian injuries and fatalities in accidents between passenger cars and pedestrians (adults and children) while reflecting the latest accident data of ESV member countries.

2. Target Timing

   The above proposal shall be reported to the 17th ESV Meeting scheduled for 2001.

3. Method of Realization

   The experts selected from ESV member countries hold meetings to discuss, formulate and finalize test procedures and its requirements through consensus among the experts.

4. Research Resources

   The experts from ESV member countries basically utilize the useful results of past studies, and when additional studies are necessary, they define the areas requiring the additional studies which shall be apportioned to ESV member countries.

5. Research Steps

   (1) Selection of experts.
   (2) Formulation of a research master plan.
   (3) Execution of accident survey in ESV member countries.
   (4) Comprehensive analysis based on the accident data of ESV member countries.

(5) Ranking of priorities for the development of test procedures in accordance with the results of comprehensive analysis.

(6) Identification of useful research results (biomechanics, test procedures, testing tools, etc.) and research items requiring additional research efforts, prioritization of work, and apportionment of work to ESV member countries.

(7) Development of test procedures and its requirements.

(8) Evaluation of the developed test procedures and its requirements, including cost evaluation.

(9) Finalization of the test procedures and its requirements.

At present, IHRA/Pedestrian Safety is in Step 5.

6. IHRA/Pedestrian Safety Experts Meeting

1997.7.15-16	1st Experts Meeting	Tokyo, Japan
1998.3.3-5	2nd Experts Meeting	Washington D.C.,USA
1998.9.16-18	3rd Experts Meeting	Europe

7. Matters Decided at Experts Meetings

* Experts Meetings shall be held twice a year, in principle.
* A research master plan was formulated.
* It is not possible to develop test procedures using pedestrian dummies by the 2001 target year, due to a long time needed to develop such dummies. Consequently, the component test employed by ISO and EEVC shall be employed.
* Analysis was conducted on the basis of the first accident analysis data provided by the U.S., Europe and Japan. In results:
  Higher priorities - a. Head / bonnet (adults and children)
  b. Leg / bumper.

  The above a. and b. were decided to be the combinations for which test procedures shall be developed.
* Notable characteristics of recent accidents:
  a. A decrease in pelvis / bonnet accidents due to changes in the vehicle body shape.
  b. An increase in the incidents of the adult's head colliding into the windshield glass.
* Accident data shall be rearranged using a unified format.
* An action list for future Meetings shall be produced, specifying subject matters for discussion, assigned countries, and related remarks.

* Although infrastructure and education are important in the reduction of accidents, the Expert Group shall only briefly touch upon these subjects in its final report, citing existing reports.
* The IHRA/Steering Committee has recommended the definition of passenger vehicles as those with a seating capacity of not more than 9 occupants and GVW of not more than 4,500 kg. The Expert Group shall finalize its research, analyzing accident data in accordance with this definition.
* This research shall be incorporated into the project schedule in order to verify the technical compatibility of the automobile on the whole within the test procedures to be proposed and to avoid disharmony between these test procedures and other regulations.

8. Scheduled Activities

* Reexamination of accident analysis reports.
* Identification of the most accident-prone juvenile age group for the development of an impactor for children.
* Production of biomechanical injury risk curves.
* Deciding of the cover ratio for vehicle collision speeds.
* Deciding of an injury level target for the reduction of injuries and fatalities
* Identification, prioritization and apportionment of research work.
* Development of test procedures for two combinations: head / bonnet (adults and children) and leg / bumper.
* Discussion on possibilities of utilizing a computer simulation model.

9. IHRA/Pedestrian Safety Experts Member List

Name	Title	Country
Mr. Yoshiyuki Mizuno	Chairperson	JAPAN
Mr. Hiroshi Ishimaru	Secretariat	JAPAN
Mr. Manuel Bartolo	Expert	USA
Dr. Francoise Brun-Cassan	Expert	EU
Mrs. Maria Dabrowska-Lorane	Expert	Poland
Dr. Hirotoshi Ishikawa	Expert	JAPAN
Mr. Norbert Jahn	Expert	EU
Mr. E.G. Janssen	Expert	EU
Mr. Graham Lawrence	Expert	EU
Dr. Jack McLean	Expert	AUSTRALIA
Mr. Akira Sasaki	Expert	JAPAN
Dr. Roger Saul	Expert	USA

International Harmonized Research Activities (IHRA)
Working Group on Intelligent Transport Systems (ITS WG)
Status Report

Purpose of IHRA-ITS WG

The goal of the research coordinated by the IHRA-ITS WG is to develop procedures (including methods and criteria) for the evaluation of safety of in-vehicle information, control and communication systems with respect to human performance and behaviour. These procedures are intended to address cross-cutting issues rather than to focus on specific applications.

Background

IHRA

The International Harmonized Research Activities is an inter-governmental initiative which aims to facilitate greater harmony of vehicle safety policies through multi-national collaboration in research. IHRA is organized under the auspices of Enhanced Safety of Vehicles[1] (ESV) representing the U.S., UK, Canada, the Netherlands, Germany, Australia, Sweden, Japan, France, Italy, Hungary, and Poland. In addition, the European Commission (EC) and the European Experimental Vehicle Committee (EEVC) are represented. The Working Group on ITS is one of five working groups addressing high-priority research needs.

The impetus behind this WG reflects the need for governments to understand and minimize the potentially adverse impacts of ITS technologies and to incorporate safety assurance into system development. Within the domain of ITS, traditional approaches to government intervention are limited by the lack of timely field data needed to support interventions, and the lack of a priori knowledge of system functionality needed to develop performance criteria.

Harmonized research in ITS is of special importance for three reasons, 1) it represents a significant opportunity to influence active safety[2] through effective collision avoidance intervention, 2) it addresses a global need to more clearly define the role of government with respect to ITS safety, 3) driver-ITS interaction is an area essentially unregulated at the present time; consequently, there is a greater likelihood of achieving harmonized safety policies than might otherwise be the case.

---

[1] Enhanced Safety of Vehicles is an international forum for the exchange of scientific and technological advances in vehicle safety. Until recently, the principal activity of ESV was the biannual conference which brings together motor vehicle research administrators from government and industry to explore measures to reduce the risks and consequences of motor vehicle collisions. The conference continues to be a major, though no longer the only, activity of ESV. IHRA is an initiative which has recently evolved out of the ESV conferences.

[2] Active safety (also known as primary safety or collision avoidance) refers to countermeasures which are designed to prevent collisions from occurring.

Safety Risks of ITS

The advent of ITS is revolutionizing motor vehicle transportation. Not only is the nature of driving changing radically, but it will likely to be in a continuing state of flux, at least in the foreseeable future, as technologies continue to evolve. It is extremely important to ensure that new systems and technologies are guided by human factors principles and data so that they do not lead to driver behaviours and responses which are not intended by systems designers. In aviation, for example, increased pilot assistance and automation has unwittingly reduced situational awareness and produced out-of-the-loop performance problems (i.e., increased errors and response latency). There are both micro-level (the direct effects on individual drivers) and macro-level (the effects on the overall traffic system) considerations[3]. The risks associated with increased automation (e.g., behavioural adaptation, mixing intelligent and conventional vehicles, loss of skill, negative transfer, and driver reliance on fallible technologies) are not well understood and cannot be reliably predicted at present.

It is essential to recognize that intelligent technology per se is neither inherently beneficial or detrimental to safety. The impact of technological change on safety will depend on its implementation and, in particular, on the extent to which the system supports drivers' needs and is compatible with human capabilities and limitations. The primary human factors issues concern central human processes such as situational awareness and cognition. Secondary issues concern peripheral processes (e.g., legibility) that are affected by the physical design of the human-machine interface.

The WG on ITS was established to help governments to better understand the safety benefits and risks associated with on-board ITS and to recommend a generic framework for evaluating the safety of driver-ITS interactions.

Scope

The WG is a forum for multi-national research with the aim to develop safety evaluation procedures that can form the basis of harmonized national policies on ITS[4]. It is recognized that industry's role is to develop products that are effective, safe and acceptable to the public. Government's role is to ensure that products comply with appropriate safety criteria. The development of such criteria is the raison d'etre of this WG. It should be noted that while there are numerous groups developing ITS standards and operational requirements, no other body is developing procedures for evaluating the safety of on-board ITS devices.

---

[3] See Noy, Y I, 1997, Human Factors in Modern Traffic Systems. Ergonomics 40(10), Taylor & Francis.

[4] Policies can take the form of government regulation or memoranda of understanding with industry. Safety requirements can take the form of content oriented or process oriented requirements. Content oriented requirements prescribe test protocols and compare measured values against a pre-established criteria. Process oriented requirements specify system design and development processes to ensure that relevant safety issues have been considered. Process oriented requirements can also address organizational safety management practice, including core competencies of safety professionals, development of product safety information, and guidelines for auditing of the safety system.

Certain intelligent technologies are being developed with the express purpose of assisting drivers to avoid collisions (e.g., so-called collision avoidance systems include forward obstacle collision warning system, lane departure warning systems and fatigue warning systems); whereas other systems are being developed to enhance driver convenience (e.g., navigation, adaptive cruise control). Since both types of systems can affect safety, the framework is intended to apply to all on-board information, control and communication systems, whether they be collision avoidance systems or driver convenience features.

The WG is concerned with summative evaluations; that is, final test and evaluation of systems prior to their introduction into the market. It is recognized that during their development, systems undergo design iterations that involve the collection and analysis of relevant human performance and other data. These formative evaluations are conducted at various stages of system development to check system performance against corporate objectives and specifications. They are primarily within the control and serve the interests of industry and, as such, are beyond the scope of this WG. While formative evaluations are important and can contribute to overall system safety, safety assurance relies on evaluations of systems that are ready for implementation in the real world.

The procedures considered by this WG for the safety evaluation of ITS apply to all on-board systems that involve driver interaction (either directly or indirectly) and take into consideration the influence of human factors ranging from behavioural adaptation to driver reactions to possible system failures. It is intended that the evaluation of a system (whether it is an individual component or an integrated multi-function interface[5]) be performed in the vehicle(s) for which such a system is designed.

Safety Assurance Model

This WG is not concerned with all aspects of ITS safety and is not the only body concerned with ITS safety. In order to illustrate the role of the IHRA-ITS WG in relation to that of other groups, a simplified model of ITS safety assurance is presented in Figure 1. The model posits that safety is optimized by (1) adherence to accepted safety principles, (2) conformity with existing human-machine interface (HMI) standards, (3) conformity with minimum criteria for collision avoidance systems (CAS), if applicable, and (4) implementation of a safety assessment program. These are shown in the model as four separate blocks and are briefly described in the sections which follow in order to elaborate the model. While all of these elements are important for safety, the work of the IHRA-ITS WG is focused on developing a framework for final test and evaluation of system safety. This element is indicated in the figure by the shaded block. Other organizations are involved with other blocks of the model, as described in the sections below.

Various systems should be evaluated together when they can co-exist in a vehicle. For example, separate systems for adaptive cruise control and forward collision obstacle detection may produce redundant or conflicting messages. A full appreciation for the interactions of such systems can only be gained by concurrent evaluation.

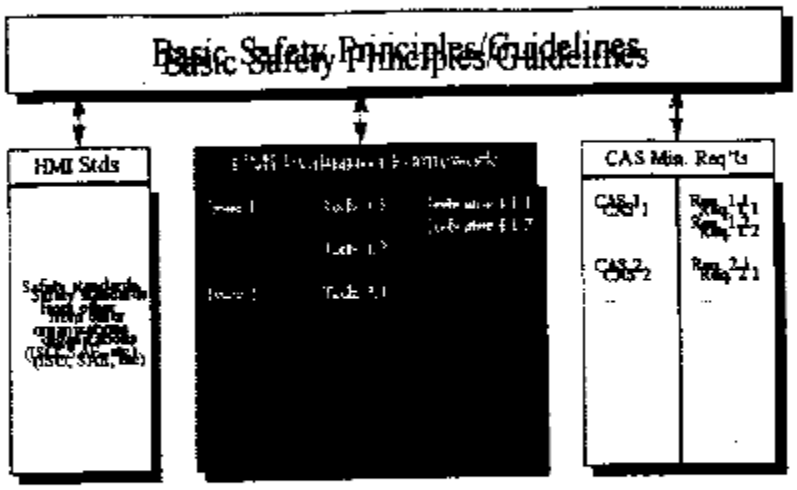


Figure 1: Principal Elements of ITS Safety Assurance

Basic Safety Principles/Guidelines

The basic safety principles/guidelines provide general, widely-accepted design and operational information to promote system compatibility with known driver characteristics. The European Code of Practice on Human Machine Interface for In-Vehicle Information and Communication Systems and the Draft British Standards Institute Guide to In-Vehicle Information Systems are examples of basic design guidelines. The guidelines in this category, however, are very general. For example, they may state that functions or display modes that overload the driver or intrude on the driving task should be disabled while driving, but they do not specify the functions or modes or indicate what constitutes overload or intrusion. To augment these basic guidelines, human factors engineering principles (e.g., stimulus-response compatibility) are available from standard references.

Human-Machine Interface (HMI) standards

Another important element in the model concerns automotive human-machine interface (HMI) standards such as the design of visual and auditory displays. HMI is defined broadly and includes design aspects such as system functionality, message prioritization in addition to the physical characteristics of the interface. Several standards bodies (e.g., ISO, SAE,) are working to develop industry standards for HMI with a view towards providing an ergonomically sound interface that is compatible with driver needs, capacities and limitations. Standardization of HMI elements facilitates drivers' understanding of system function and ensure consistency of operation.

Relevant HMI standards are developed primarily by ISO/TC22/SC13/WG8. However, other groups also develop HMI-related standards. The standards or work items currently under development within WG8 include:

- Visual Presentation of Information
- Auditory Information Presentation
- Dialogue Management

- Measurement of Driver Visual Behaviour
- Priority of TICS Suitability of TICS for Use While Driving
- Comprehensible Presentation of Visual Messages
- Audible Symbols
- ACC Systems - MMI Requirements

Standards pertaining to ITS-related visual symbols are being developed by WG5.

Relevant standards under development within ISO/TC204/WG 14 include:

- Mayday Systems
- Adaptive Cruise Control

Relevant standards under development within SAE ITS Human Factors and Safety Committee include:

- Navigation Function Accessibility
- Navigation MMI
- ACC MMI and Operating Characteristics
- Message Priority

Collision Avoidance Systems Minimum Requirements

Collision avoidance systems are systems that detect hazardous conditions and either warn the driver or trigger an automatic avoidance manoeuvre such as braking. The distinction between collision avoidance systems and other types of ITS is often not clear. For example, an adaptive cruise control is normally described as a convenience feature, especially if deceleration is limited to that available from engine power. If the same system also warns the driver of a forward obstacle it may be referred to as a forward obstacle warning system and if that system is capable of initiative braking it is a collision avoidance system.

Collision avoidance systems present a formidable challenge to designers because of the necessity to provide the driver a clear message in a short period of time in such a way as to be non-startling and without risk of causing inappropriate response. Because collision avoidance systems intervene in situations where the risk of collision is moderate or high, it is important to establish minimum functional requirements. Several groups are working to develop minimum requirements for specific CAS. However, no standard or guideline presently exists to help designers select appropriate functional characteristics to maximize safety benefits.

Relevant standards under development within ISO/TC204/WG 14 include:

- Forward Obstacle Warning System
- Traffic Impediment Warning System
- Maneuvering Aid for Low Speed Operation
- Lane Departure Warning System

Relevant standards under development within SAE ITS Human Factors and Safety Committee include:

- Forward Obstacle Warning MMI and Operating Characteristics

- Side Obstacle Warning Backup Warning

Other collision avoidance systems not being addressed include driver condition warning, and intersection collision avoidance.

Human-Machine Interaction Evaluation Framework

Existing guidelines, HMI standards, or minimum functional requirements for CAS, do not adequately address the safety assurance requirements of ITS for which the underlying technologies and functionality are constantly changing. Technology is advancing more rapidly than the scientific knowledge about its effects on driver performance and behaviour. For this reason, there will likely be an increasing need for prospective techniques for evaluating the safety of on-board systems in the development and certification of ITS vehicles. Questions about what issues need to be addressed in these evaluations, how to investigate them and what criteria define acceptable performance constitute the subject matter for collaborative research.

The development of the framework for evaluation of ITS systems represents the core work of the IHRA-ITS WG. An initial outline of the framework is presented in Figure 2. The details are to be developed through consolidation of scientific knowledge and further research.

The framework is based on consideration of the main behavioural mechanisms by which on-board information, control or communication system can influence safety. Four main categories of safety mechanisms are identified in the framework; direct safety effects, behavioural adaptation, workload, and usability. Evaluations should address each of these broad areas to ensure that system design and integration is safe and compatible with the driving task. For each safety mechanism, techniques will be identified that can be used to assess the adequacy of system safety performance. Safety indicators, or measures believed to be relevant to safety will be specified for each technique indicated. Since it is unlikely that absolute safety performance criteria can be established in the foreseeable future, the techniques may take the form of comparative evaluations in which the subject system is compared against a benchmark. Benchmarks are reference levels of performance that are considered to be acceptable from a safety perspective. They might, for example, indicate baseline levels of performance (e.g., without the ITS). The driver and driving conditions to be represented in the evaluations are the same for all safety mechanisms.

Expert groups will be formed to identify further research needs and opportunities associated with elaborating the framework. To start the process, recognized experts in each of the four principal safety mechanisms, as identified in the table, would be asked to prepare a brief summary of the current state-of-the-art in their selected area. This would be followed by the formation of expert groups which would organize separate workshops in each area with the specific aim of summarizing current knowledge and formulating research recommendations. A fifth expert group would then consider what driving tasks and driving conditions should be incorporated in the summative evaluations.

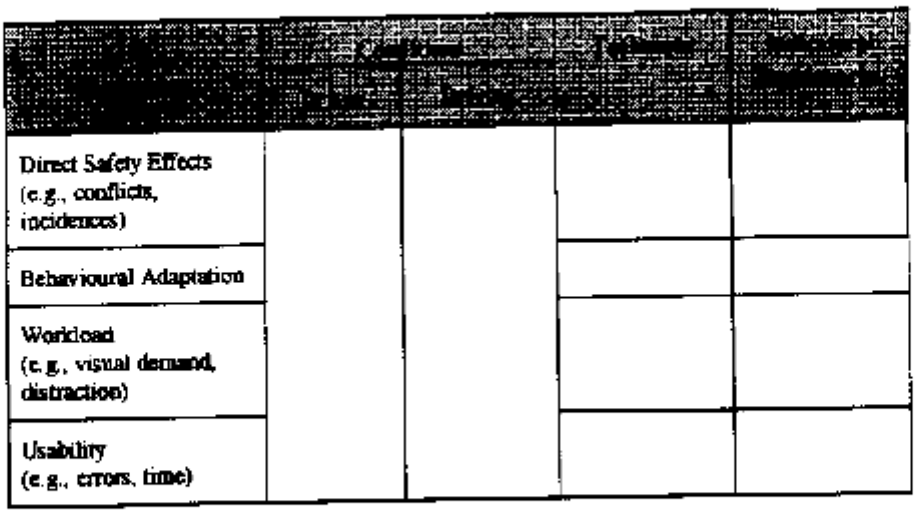


Figure 2: ITS Evaluation Framework

Recent WG Activities

Workshop

An ITS Safety Test and Evaluation workshop was held in conjunction with the Third ITS World Congress in Berlin, October, 1997. There were many good presentations covering a broad range of evaluation techniques - too many, in fact, for in-depth discussion. Some of the techniques presented are summarized below. Many important aspects of evaluation were raised that are not immediately apparent. For example, the need to consider the impact on non-equipped vehicles and the influence of driving style on test results are important considerations in the evaluation of safety.

Several European projects have attempted to address this topic, with limited success due to lack of continued funding. Specifically, Drive II projects (HOPES, HARDIE, EMMIS, and GEM) attempted to prepare frameworks, guidelines, and methodologies for safety assessment of in-vehicle systems. They collected a lot of data and developed, manuals, databases, and tools such as Skill Acquisition Network (SANe) and Dialogue Design and Evaluation Method (DIADEM). However, the results of these efforts have not addressed safety specifically, they lack full scale context and employ too many measurements. Continuation of these types of studies have not been supported by European Commission (EC).

Summary of techniques presented

1. Usability testing using field operational tests, including de-briefings and focus groups (ref: UMTRI ACC study, J. Sayer). A feature of the data acquisition system was identification of events of interest (e.g., lane change) and capture of video data prior to and following events. The importance of collecting baseline data by individual parameters (e.g., age) was emphasized.

2. Field operational tests (ref: PSA Peugeot Citroen study of ICC, Florence Nathan). Collected engineering data in addition to human factors data, to facilitate communication with designers. Raised the issue of effects on drivers of non-equipped vehicles and other road users. Also indicated the need to include individual difference parameters such as driving style.
3. Open-road evaluation using behavioural and verbal protocol analysis to obtain insight into driver strategic behaviours (ref: INRETS/Renault study, F. Saad). Researchers analyzed general behavioural data as well as specific lane change manoeuvres. Concluded that drivers of ACC-equipped vehicles tend to exhibit fewer manoeuvres and greater left lane driving. Also showed an overall reduction of time headway with ACC. However, when performing lane change manoeuvres, time headway depended on traffic conditions (higher with ACC under lighter traffic and higher when pulling out to pass with ACC). Concluded that situational variables and driving style are important factors.
4. Simulation for prospective evaluation of safety (ref; Lena Nilsson). A major point raised was the need to look at the individual road user as well as effects on traffic and society (as filtered through the traffic system). However, we do not have an adequate understanding of safety and therefore must rely on surrogate measures.
5. Computer-based checklist (ref; Karel Brookhuis). The development of a relatively quick prospective assessment of IVIS was described. This is still under development in the Netherlands.
6. Secondary task methodology to assess mental demand in laboratory and in the field (ref: University of Cologne, Hering).
7. Combination of techniques to address a comprehensive evaluation of the issues (ref; Tijerina) during CAS development. A framework for evaluating lane change crash avoidance systems was presented as an example. The framework consists of a series of questions to be considered during evaluation and indicates the possible methods that might be applied to address these questions. A comprehensive evaluation should address at least the following questions:
    - Does the CAS address driving conditions related to crash involvement?
    - Does the CAS logic support driver's decision making tasks?
    - Is the CAS display location compatible with normal driver behaviour?
    - Does the CAS match the driver's sensory characteristics?
    - Is the CAS display content meaningful to the driver?
    - Does the CAS have any unintended negative safety consequences?
    - Does the CAS reduce crash incidence or severity?

Other Information

Ford and GM have established a program of collaborative research, Crash Avoidance Metrics Partnership (CAMP), to accelerate development of ITS countermeasures by pre-competitive assessment of the need, feasibility and marketability. Current area of interest is rear-end collision countermeasures, including development of relevant scenarios, functional requirements and test methodology.

NHTSA's current research is focused in three categories: projects related to specific collision types (rear-end, road departure, lane change and merge, heavy vehicle stability, intersections), driver performance (driver status monitoring, vision enhancement, human-vehicle interaction), and

post-collision injury mitigation. The Intelligent Vehicle Initiative (IVI) developed to facilitate product deployment, includes development of services (autonomous and cooperative), selection of services for integration, integrated system design and development, operational tests and evaluation.

Literature Database

The WG is in the process of developing a database of research relevant to ITS safety test and evaluation. The database will include work either on-going or completed in the last five years that may be relevant to the development of procedures that can be used to assess the safety of on-board information, control and communication systems with respect to human performance and behaviour. The techniques may include measures of performance, workload assessment, usability, situational awareness, protocol analysis, human reliability analysis, etc. A survey form was developed and distributed to WG members for completion. The database will be updated on an on-going basis.

Relations With Other Groups

A number of related activities have taken place recently involving other groups. For example, a proposal to amend the ECE Consolidated Resolution on the Construction of Vehicles (R.E. 3) to include new "Guidelines for the Design and Installation of Information and Communication Systems in Motor Vehicles" was submitted to WP29 by German Experts. WP 29 deferred discussion on this proposal until June 1998. The European Commission has adopted a "Code of Practice on HMI for In-Vehicle Information and Communication Systems". In addition, the EC DGXIII High Level Group on Telematics has developed a draft report, "Telematics and Intelligent Transport Applications for Road Safety". In addition, guidelines are under development in Japan and Europe addressing the safety considerations related to ITS.

The WG is in the process of establishing liaison with other groups, including;

- European Commission, Directorate-General XIII/C/6
- European Commission, Directorate-General VII
- OECD
- APEC- Special Interest Group on ITS
- INRETS: Programme de recherche et développement des indutries en transport (PREDIT)
- Organisation Internationale des Constructeurs d'Automobiles (OICA)
- Comite de Liaison de la Construction d'Equipments et Pieces pour Automobiles (CLEPA)
- UNECE Working Party 29
- European Union High Level Group on Road Safety
- European Union High Level Group on Telematics
- ACEA/EUCAR Telematics Working Group 'H'
- ERTICO
- ITS America
- VERTIS Office
- JAMA

- AAMA
- US Car
- ISOTC22/WG 8
- ISO/TC204
- ISO/TC204/WG14
- Joint HLG Task Force
- CEN TC 278
- PIARC Committee C16
- PIARC Committee C13 WG6
- FCAT (Australia)
- FAIM (Australia)
- ITS Australia
- ITS Canada
- SAE ITS Safety and Human Factors Committee
- Canadian Vehicle Manufacturers' Association (CVMA)
- Association of International Automobile Manufacturers of Canada (AIAMC)

REPORT TO THE 16TH ESV CONFERENCE FROM

THE IHRA COMPATIBILITY WORKING GROUP

Current Members:

Mr Keith Rodgers	UK	Chairman
Mr Keith Sayer	Aus	
Mr Eric Welbourne	Can	
Dr Tom Hollowell	US	
Mr Kazuo Oki	Jap	
Mr E Faerber	EEVC	
(Vacant - France)	EEVC	
Ms Adrian Hobbs	UK	Secretary

REPORT TO THE 16TH ESV CONFERENCE FROM THE IHRA COMPATIBILITY WORKING GROUP

Keith Rodgers (Chairman)

INTRODUCTION

At the Melbourne ESV in May 1996, as part of the International Harmonised Research Activities (IHRA), it was agreed that one of the six Working Groups set up one was to study compatibility. It was recognised that separate regulations on frontal and side impact do not address compatibility problems. Research programmes on compatibility between cars are now active in a number of countries and it was agreed that international co-ordination on all this work would be beneficial.

The European Union and the European Enhanced Vehicle-Safety Committee were asked to be the lead group for the compatibility work. In turn the United Kingdom was invited to nominate a chairman for the working group. Action was take in early 1997 to set up the group and define its objectives. Meetings so far have been held in June and October 1997 and in February 1998. The fourth meeting is to take place during the ESV conference, in Windsor.

AIM

The aim of is to develop internationally agreed test procedures designed to improve the compatibility of car structures in front to front and front to side car to car impacts thus enhancing the level of occupant protection provided in frontal and side impacts. A secondary aim will be to consider the protection in impacts with pedestrians, heavy goods vehicles and other obstacles.

PARTICIPATION

The EU and EEVC agreed that participation in the IHRA Working Group from within Europe would be limited to the Chairman and Secretary plus two Members from EEVC Working Group 15 which is studying compatibility issues within Europe. In addition to these four members representatives have also been nominated from the United States, Canada, Australia, Japan, and Poland.

The IHRA Steering Committee meeting in November 1997 agreed that all IHRA Working Groups should have representation from industry. A letter was sent by NHTSA to OICA in March 1998 inviting them to nominate three Working Group Members from industry to represent North America, Europe and the Far East. It is anticipated that future meetings of the Working Group will include these representatives.

WORKPLAN

When IHRA was set up in 1996 it was agreed that the aim should be for all work groups to have completed their tasks in time to report to the ESV conference in 2001. With regard to compatibility this is an act of faith as the problems are not simple and require a timely breakthrough if this programme is to be met.

At Annex A shows the work planned which is broken into three main activities:

- **Problem definition.** Real life accidents are the key to defining the compatibility problems that exist today. This work is to study the statistics on fleet make up in various countries as well as the types of

accidents that occur on their roads. It will be necessary to extract from this information accidents where compatibility has had a part to play in the outcome. Once these accidents are identified they can be used to determine the important characteristics for compatibility.

- **Key characteristics.** Once found, these characteristics will be used to replicate real accidents by crash testing, and by system modelling to be able to understand what is happening on the road. By this means it should be possible to develop a hypothesis on compatibility and find out how the effects can be mitigated.

- **Assessment methodology**. The final phase of the workplan is to develop testing protocols which when adopted into regulations, will ensure that vehicles become more compatible.

At Annex B shows the tasks that each member has agreed to undertake and the time frame which is being allocated for them to be completed. As it will be seen this predicts a completion of the work activity at year 2000, but as explained there is no clear way to achieving the goals by this date

PROGRESS

Fleet Studies

The EEVC working group had in place a work task to create a data base of current cars in Europe giving the various parameters for each model that it was thought would influence compatibility. These parameters included such factors as types of structure and the position of stiff elements that would react with one another in accidents. This work is almost complete.

In the USA work had been completed to categorise the vehicle fleet and study how this was changing. A particular problem identified was the number of sport utility vehicles entering their market. It became apparent that the size difference between these vehicles and the rapid growth in the proportion of these types of vehicle in the fleet was going to pose a big problem for compatibility.

Elsewhere work on fleet studies has yet to be reported to the IHRA working group but work has been promised for the future.

Accident Studies.

Accident studying in a number of countries in Europe is very mature and ranges from the collection of overall statistics to detailed investigations of specific accidents. Investigations are carried out "on the spot" in some countries whilst in others the work is done post accident. Experts have been assembled to discuss compatibility issues as displayed by current accidents, but as yet no conclusions have been drawn from this work. The intention is to identify types of vehicle that exhibit both good and poor compatibility and then study individual accidents involving these types to obtain information to be taken forward into the "key characteristics" phase.

In the USA work has been completed on studying the compatibility aspect of the existing fleet allowing vehicles to be positioned in a compatibility matrix. Follow up studies using current accident data will continue for the period of the IHRA work.

Elsewhere work has yet to be reported to the IHRA working group.

Modelling

Modelling programmed under the work plan controlled by EEVC WG15 has just started and as yet there is little output. The intention

is to use this work in conjunction with the crash testing programme. Some finite element models will be obtained through the work in the USA on compatibility and TRL is also using FE models supplied by some manufacturers. The UK is also funding some further modelling effort in this area which will be fed in through WG15

The USA modelling programme is advanced both in deriving individual models for representative fleet vehicles, as well as in producing a system model of vehicle accident activity in the US. So far no other modelling activity is occurring elsewhere in the programme

Crash Testing

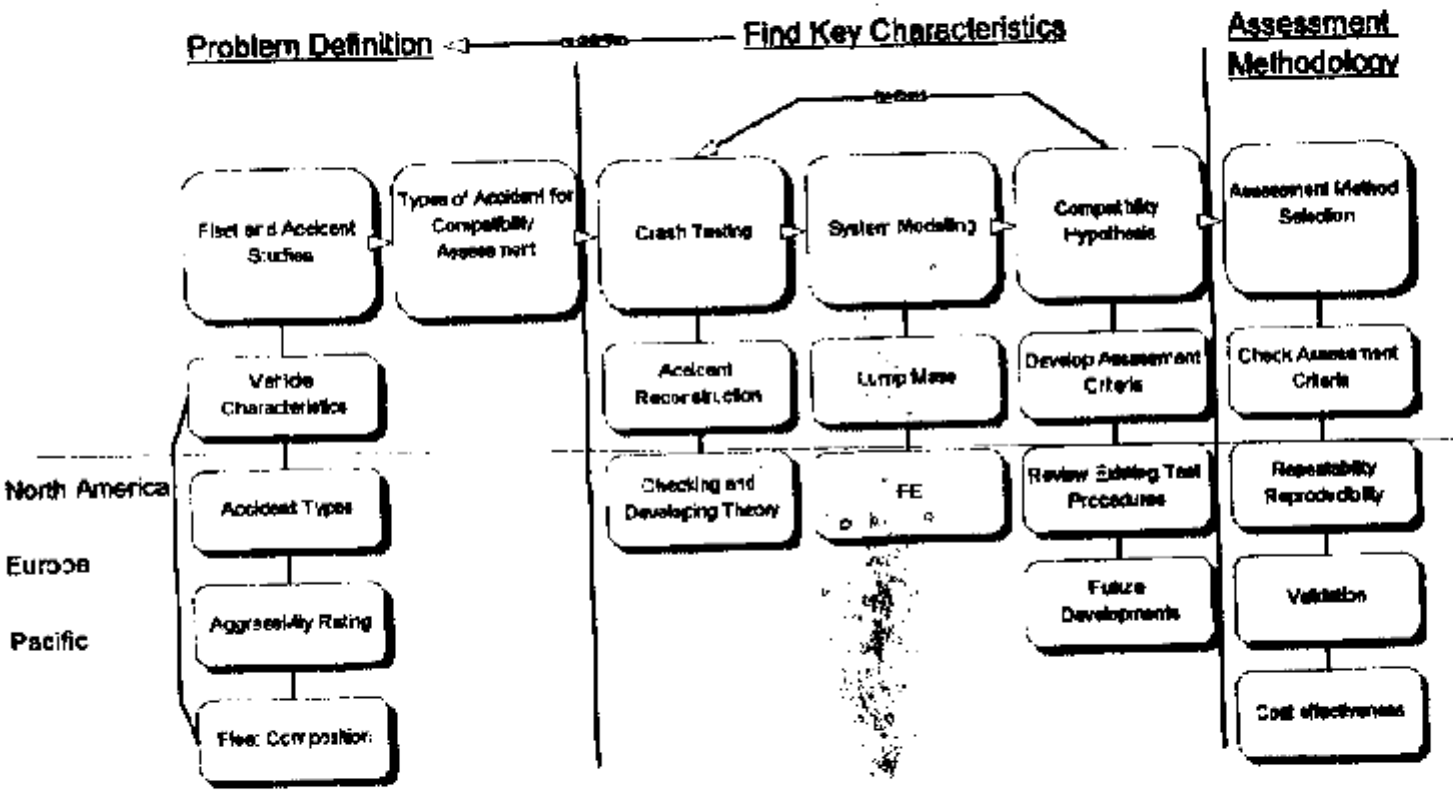
As yet no crash testing has occurred specifically for IHRA. This activity is about to get under way in the US, but the EEVC work awaits better definition from the accident and modelling studies.

CONCLUSIONS

The IHRA Comparibility working group was set up after work in the area was already underway in several countries. The task of the working group has been to co-ordinate these efforts, and to steer them towards common goals. One of these goals is to have results available by 2001, to achieve this all participants have been encouraged to think now about possible testing methods so that there can be concurrent activities to reduce the overall time frame. A second goal concerns deriving common methods to control compatibility, which takes into account the dissimilar conditions applying on different continents. It is apparent that fleet mix could be an area which poses a problem as the average sizes of vehicles vary dramatically between continents.

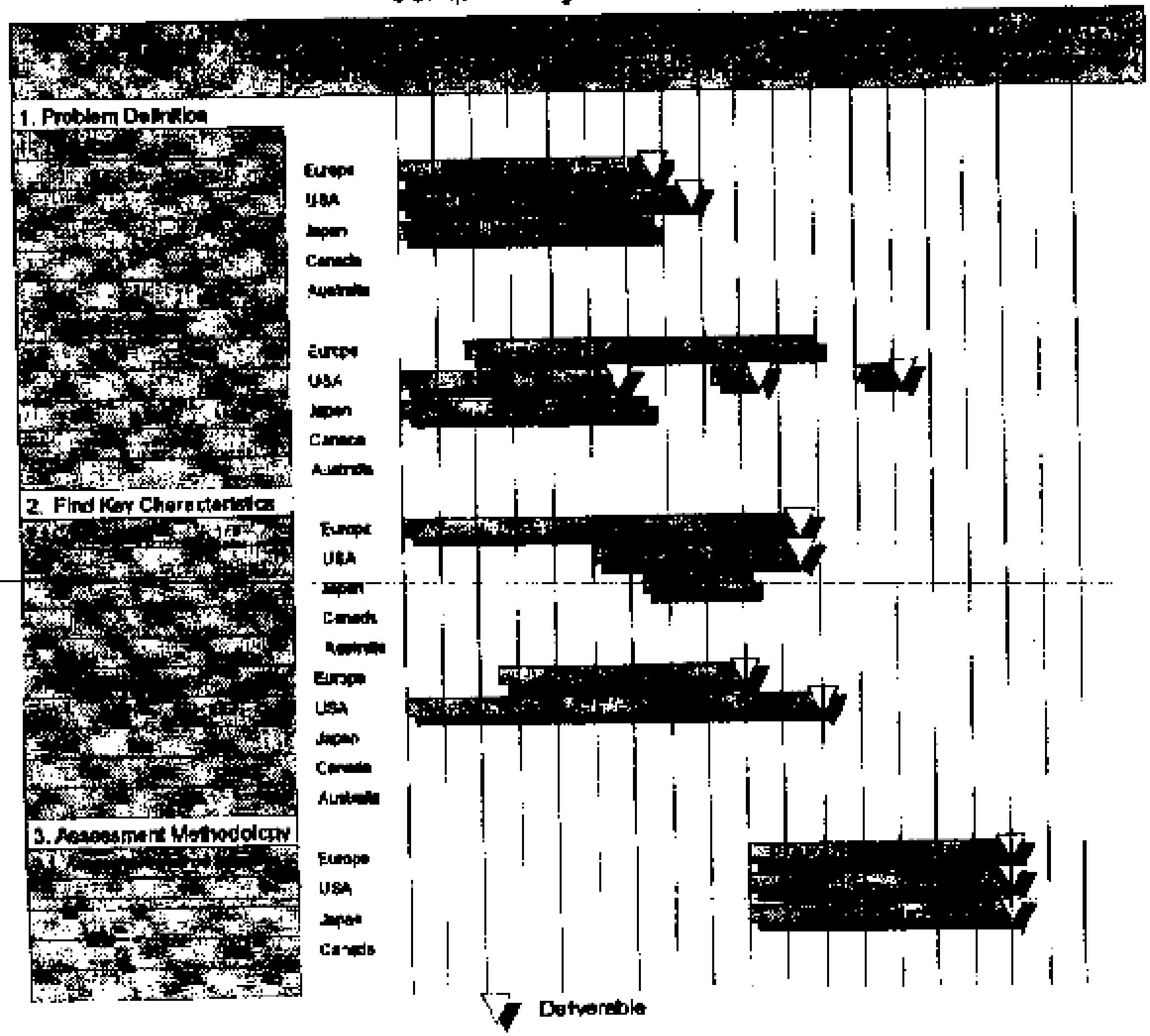
Annex A

International Harmonised Research Agenda
Compatibility Research
Lead Country: EU/EEVC



Annex B

Compatibility Research



INTERNATIONAL HARMONIZATION OF BIOMECHANICS RESEARCH: STATUS OF THE WORKING GROUP ACTIVITIES

F. Bandak[1], D. Cesari[2], D. Dalmotas[3], R. Eppinger[1]
K. Ono[4] K. Seyer[5], E. Welbourne[3], J. Wismans[6]

[1]National Highway Traffic Safety Administration
United States

[2]Institut National De Recherche sur les
Transports et leur Securite
France

[3]Transport Canada
Canada

[4]Japan Automotive Research Institute
Japan

[5]Federal Office of Road Safety
Australia

[6]TNO
The Netherlands

INTERNATIONAL HARMONIZATION OF BIOMECHANICS RESEARCH: STATUS OF THE WORKING GROUP ACTIVITIES

F. Bandak[1], D. Cesari[2], D. Dalmotas[3], R. Eppinger[1], K. Ono[4], K. Seyer[5], E. Welbourne[3], J. Wismans[6]

[1]*National Highway Traffic Safety Administration*
United States

[2]*Institut National De Recherche*
sur les Transports et leur Securite
France

[3]*Transport Canada*
Canada

[4]*Japan Automobile Research Institute*
Japan

[5]*Federal Office of Road Safety*
Australia

[6]*TNO*
The Netherlands

INTRODUCTION

This report gives a summary of the activities of the International Harmonized Research Activities (IHRA) Working Group on Biomechanics Research. The Working Group was formed in 1997 after the IHRA Steering Committee meeting in Washington, DC, where the United States presented the NHTSA plan for the harmonization of biomechanics research. The focus of the group is to obtain international agreement on a framework and to develop a five year agenda for the harmonization of biomechanics research.

The first meeting of the Working Group on Biomechanics Research was held in Hanover, Germany, September 22, 1997, in conjunction with the IRCOBI Conference. The delegates representing Japan, Europe, and North America were present with Mr. K. Ono representing Japan, Dr. J. Wismans and Dr. D. Cesari representing the EEVC, Mr. D. Dalmotas representing Canada,, and Dr. F. Bandak representing the United States. The meeting produced agreement on the research priorities and on the development of a framework and a five year agenda for the world wide harmonization of biomechanics research.

PROCEEDINGS OF THE FIRST BIOMECHANICS WORKING GROUP MEETING

Each member opened with a discussion of his respective country's harmonization priorities and a brief description of on-going candidate research areas for harmonization.

Mr. Dalmotas emphasized the high priority of exploring sound alternatives as replacement candidates for the current HIC as a measure of closed head injury. He also reiterated the need for obtaining a biofidelic neck to alleviate the current response inadequacies that the current Hybrid III-type necks exhibit for rear impacts, child and small female representation, and combined neck loading assessment. Mr. Dalmotas informed the Working Group of Transport Canada's efforts to develop a means for interpreting output for Hybrid III legs to satisfy the current urgencies in light of the absence of an alternative.

Mr. Ono presented the harmonization priorities for Japan emphasizing the need for harmonization of injury criteria and dummy development for side impact, child injury, frontal, and rear impact. He highlighted the differences in evaluation criteria between dummies and the existence of

multiple dummies for the evaluation of the same type of restraint system. Mr. Ono also pointed out that it is necessary insure that the leg has higher biofidelity for full frontal and offset impact conditions. He also indicated the desire for further international cooperation facilitating the development and eventual adoption of the THOR dummy.

Dr Cesari discussed on-going research addressing the need for the establishment of head/brain and neck injury mechanisms and tolerances for the purpose of proposing testing specifications for motorcycle safety helmets. Dr. Wismans emphasized the need for research to identify injury mechanisms and provide low level neck response characterization for whiplash injury. He described on-going research in that area and in the area of side impact dummy biofidelity evaluation and enhancement. He announced the start of SID-2000, a 26 month program that will produce side impact dummy design enhancements and injury risk functions. He updated the Group on the whiplash research and the Advanced crash Dummy Research for Injury Assessment in frontal test conditions (ADRIA) programs to address injury biomechanics and dummy development for whiplash injury and frontal impact injury respectively.

Dr. Bandak emphasized the future needs for the development of advanced frontal dummies and the current needs for cooperation on a set of up-to-date harmonized injury reference values for the family of Hybrid III dummies. He discussed NHTSA's on-going projects on head/brain and neck injury, chest injury, and ankle injury. He informed the Group of NHTSA's side impact research and Hybrid III dummy (5th, 95th, 3 & 6 year old) testing and evaluation. He also emphasized the need for a harmonized biomechanics data exchange protocol and presented NHTSA's approach. Dr. Bandak also discussed the need for standardizing computer models and computer codes.

RECOMMENDATIONS AND RESEARCH PRIORITIES

The Working Group agreed on an order of biomechanics research priorities that best reflects the needs of the member countries as a group. A discussion of the priority research areas is given below.

Frontal Impact - In light of the areas of research on-going in the various member countries related to frontal impact biomechanics the Working Group recommended that high priority be given to head/brain/face, neck, chest/abdomen, and lower extremities injury research. The Group also recommended cooperation on the development and evaluation of the advanced frontal dummy (THOR) under development by NHTSA.

Side Impact - The Working Group recommended that high priority be given to the generation of a harmonized strategy for the development of advanced world side-impact dummies. Assessment of the state of the existing side impact dummies, supporting biomechanics, and injury data is on-going as part of programs within the member countries. This presents a significant leveraging opportunity for cooperation in the development of advanced dummies for side impact addressing the issues of injury criteria, biofidelity requirements, and dummy sizes.

Whiplash - The Working Group recommended cooperation in the area of neck injury criteria development including low level injury. Priority was recommended for research in injury mechanisms, low level neck response characterization, dummy and test procedure development.

Child Dummies - The Working Group recommended evaluation of recent testing (conducted by the member countries) on current child dummies that will help form the basis for IHRA Working Group recommendations on the development of a family of advanced child dummies. The Working Group recommended a two year period for this evaluation.

Data Harmonization and Exchange - The Working Group recommended that the new database approach, under exploration by the NHTSA National Transportation Biomechanics Research Center, be evaluated by the member countries for possible acceptance as an additional mechanism for data exchange supporting harmonization.

Computer Modelling - The Working Group recommended the creation of a steering subgroup to work as part of the IHRA Biomechanics Working Group to oversee a two-year study for the evaluation of the current modelling activities on-going by the member countries. The Steering Sub-Group on Computer Modelling shall then recommend possible approaches to the harmonization of computer models and programs.

Industry Representation - The Working Group recommended that three industry representatives be invited as members of the IHRA Biomechanics Working Group with one member representing each of, North America and Australia, Japan, and Europe.

SECOND MEETING OF THE WORKING GROUP ON HARMONIZATION OF BIOMECHANICS RESEARCH

The second meeting of the IHRA Working Group on Biomechanics Research was held in Orlando, Florida, USA, on November 12, 1997 in conjunction with the Stapp Conference. The meeting was attended by Dr. Wismans and Dr. Cesari representing the EEVC, Mr. Dalmotas representing Canada, Mr. Ono representing Japan, Mr. Seyer representing Australia, and Dr. Bandak representing the United States.

The topic of discussion at the second meeting of the IHRA Biomechanics Working Group was development of a harmonized side impact dummy. This topic was identified as a priority at the previous IHRA/BIO/WG meeting and was endorsed as an issue of priority at the IHRA Steering Committee meeting in Geneva in November, 1997. The position of the Working Group on this issue is given in the following section.

Harmonization of Side Impact Dummies - In the 1980's, the governments of the US and European countries developed dynamic side impact regulations, the US FMVSS 214 and the ECE Regulation 95. Intending to improve occupant side impact protection, these regulations produced different test procedures, test devices, and injury criteria with the US and Europe specifying the use of the USSID and EUROSID respectively. The two procedures and two dummies are substantially different making harmonization to one global side impact standard quite a non-trivial task.

The state of world side impact regulation today (two standards/two dummies) has significant disadvantages particularly with the associated increases in vehicle development, safety, and testing costs. While the recognition of such disadvantages associated with different regulatory standards for different markets is quite apparent, little or no advancement of an agreement on a harmonized side impact regulation has occurred until recently. There now exists a worldwide recognition of the need to harmonize on a single side impact dummy to facilitate more economical development of safe vehicle designs that can be sold in the global market. This is an essential step in the worldwide harmonization of side impact standards.

Over the past few years several efforts have been initiated in the US to develop new side impact dummies, the BIOSID (by General Motors) and the SIDIIs (through USCAR). These two dummies have been used primarily by the industry as research tools for the purposes of in-house evaluation of vehicle designs. There are currently two new initiatives to build on current side impact dummy technology to develop advanced side impact dummies. One of the projects, sponsored by a European Commission, involving government and industry organizations, was recently introduced and is referred to as SID2000. This project is expected to start January 1, 1998 and continue for a period of 26 months to (1) evaluate the SIDIIs and EUROSID1 dummies against the current state of biomechanics knowledge on side impact, (2) make recommendations to improve EUROSID, and (3) examine the need for dummy sizes other than the 50th percentile male.

The other project is based on work conducted over the past few years in the US and sponsored by USCAR for the development of the 5th percentile female side impact dummy, SIDIIs. This project initially called for the use of this dummy to form a basis for the development of a new 50th percentile side impact dummy under the auspices of the ISO/TC22/SC12/WG5. The ISO WG5 project was initially moving on a separate track from the SID2000 project. However, a recent resolution passed during the November, 1997, ISO/TC22/SC12/WG5 meeting proposed the introduction of a strategy to merge these two initiatives for the purpose of producing a globally harmonized dummy.

The recommendation of the September, 1997, meeting of the IHRA Biomechanics Working Group to include side impact dummy development as a priority was taken up by the IHRA Steering Committee in November, 1997. Further steering committee discussions at that meeting resulted in acknowledgement that two separate dummy development efforts will lead to harmonization difficulties down the road. This is consistent with the notion that the issue of developing a harmonized SID should be a priority of the IHRA/BIO/WG. It is also believed that that the IHRA/BIO/WG is the government forum that can enhance the likelihood of agreement on a harmonized dummy. The Working Group can facilitate the early development of an acceptable framework that serves as a basis for achieving a harmonized dummy. This allows the various contributions from all groups including ISO/TC22/SC12/WG5 and SID2000 to focus on a common plan of action. It is therefore recommended that the development of a world harmonized side impact dummy be conducted with the full participation of the IHRA Biomechanics Working Group as the representing body for IHRA.

INTERNATIONAL HARMONIZED RESEARCH AGENDA (I.H.R.A.)

STATUS REPORT OF THE ADVANCED OFFSET FRONTAL CRASH PROTECTION GROUP.

Claudio Lomonaco
Ministry of Transport
Italy
Paper Number ....

STATUS REPORT OF THE ADVANCED OFFSET FRONTAL CRASH PROTECTION GROUP.

Claudio Lomonaco
Ministry of Transport
Italy
Paper Number ....

ABSTRACT

This paper will provide an overview of the work progress of the advanced offset frontal crash protection group of IHRA. It remarks, including tables and a final flow chart, the strategy of the group to cope with the assigned task . This is the commitment to achieve an harmonized frontal crash protection procedure taking into account the different world wide views in this field.

INTRODUCTION

At the ESV Government Focal Point Meeting on International Harmonized Research Agenda held in Melbourne in May 1996, six research fields on passive safety were highlighted as the ones in which harmonization efforts could be most fruitful.
The leadership of future activities in each field was assigned to a specific country.
In particular the E.U. accepted the leadership in the field of Frontal Collision Safety.
The aim of the Working group is to develop internationally agreed test procedures designed to improve the car structures in order to cope with the event of frontal collision thus enhancing the level of occupant protection provided in frontal impacts. Such task shall be accomplished defining shared verified injury criteria and, if needed, geometrical criteria on common basis.

There is a shared world wide common term of reference: the collision of two equal cars. Parameters of testing, such as tools, are diverging. Indeed the differences related to the use of different barriers (deformable/stiff barrier) multidimensional are substantial.
Differences among countries in the selection of testing procedures may be attributed to the different infrastructures and data banks. Thus regulations are diverging as a consequence of these discrepancies.

It has to be remarked that basically two main developing tendencies on frontal collision standard are present:

1) In Europe the Parliament has given mandate to DGVI to review the present Directive 96 Frontal Collision (Deformable barrier, 40% overlap, impact speed, some geometrical and dummy biomechanical parameters).
2) In the USA the Congress has given mandate to NHTSA to go through a short/medium term activity to verify the possibility to finalise a standard which could be harmonized with the European standard.
Furthermore, a long term activity has been devoted to the development of a specific USA frontal impact test carried out with a mobile deformable barrier.

WORK PROGRESS OF THE GROUP

The analysis of the differences started considering the common and the diverging aspects of the main items. Since the first meeting, the activity in progress devoted to the assessment of the different frontal impact procedures nowadays used in Europe and USA was examined.
Such procedures are different in terms of impact speeds and barrier types and for the introduction, into the USA tests of the 5th%ile female dummy.

During the discussion items and distinguishing characteristics of miscellaneous existing standards, on which activities are in progress, were pointed out, particularly in the USA, where researches using different barrier types with different impact speeds are carried out. Furthermore this country has remarkably developed in this research activity, the comparisons among different risks displayed by using dummies different by 50th%ile male, on which base the vehicle structure is tailored (5th%ile female and 95th%ile male dummies).

To this research, Canada got aimed on the topic of the dummy/Air-Bag interaction. On this side Canada has given a great contribution complementary to the US researches.

On the base of such characteristics the work has been splitted in two phases, which are corresponding to the short and long term part of the programme.

Work programme.

1 - 1st Phase (short term programme)

A board to define the main aspects was drawn by the group members. On each of these the participants of the group engaged their self to develop specific activities and to give out results.

Accordingly the table with the topics of interest has been established by the group as follows:

Table 1
Topics of interest

WORKING MATTER	USA	CAN	EEVC	J	AUS
Dummy	X				
Types of barrier	X	X			X
-stiff	x	x			x
-deformable	x	x			x
Impact angle	X				
Dummy	X	X	X		X
5th%ile female	x	x			x
95th%ile male	x	x			
Impact speed	X	X	X		X
Performance criteria	X	X	X		X
-femur/pelvis injuries	x		x		x
-steering wheel intrusion	x		x		
-abdomen injury detection		x			
-chest injury		x			
Air-Bag performance	X	X			X
-Deployment time & effects		x			
Extension to vehicle of category N1			X		

1.1 Commitments

During the discussion, the American delegate declared that NHTSA is planning in the first stage approach to study in the short term the potential benefits of the EEVC frontal test procedure under the US conditions

It appears that the EEVC test procedure may offer advantages to the USA if used with a 5th%ile female dummy, based on the dummy transducer readings in some preliminary tests. If the first stage (adoption of a modified EEVC test procedure) proves to have not potential benefit for the USA, the first stage would be abandoned and work would concentrate on the second stage.

EEVC confirmed that is going toward the solution of a fixed barrier testing on legs biomechanical criteria and higher speed of impact. Also a review of the potential benefits of using a fifth percentile female dummy in the EEVC test procedure is envisaged.

1.2 Schedule time

The group devoted to this first phase the scope and the goals, remarking that the work program has to be finalized within five years and it should be set into the following deadlines:

1. ESV Windsor Conference
   Presentation of the first report which contains the determination of research specific aspects and the working program, launching focused on the drawing up of a technical standard on frontal crash protection.

2. End 1999/beginning 2000
   Completion of the technical standard project and validation programme launching.

3. ESV 2001
   Work completion and technical standard project presentation to the ESV conference.

2 - 2nd Phase (Long term project time)

On the base of NHTSA and EEVC work plan and in order to define better the American and the European approach the group defined a comparative analysis method to cope with the second work stage that is reported in table 2.

Table 2.

Trolley-based Frontal Offset Impact Test Procedure.

ADVANTAGES	ALTERNATIVE APPROACH TO ACHIEVE SAME ADVANTAGE WITH MOBILE BARRIER
1. Takes into account the effects of the Mass Ratio of the impacting vehicles	Change impact speed with vehicle class.
2. Can evaluate angular effects on the deformation and occupant displacement	No known alternative
3. Can include a possible measure of Compatibility (by the occupant restraining the vehicle and/or trolley combination)	Monitor the force on the front barrier behind the deformable face.
4. The counteracting pulse, ΔV and energy dissipating is 'correct'.	No known alternative
DISADVANTAGES	**POSSIBLE ACTIONS TO REDUCE THIS DISADVANTAGE**
1. Complex test procedure for "moving barrier-moving car" (High speed trolley vehicle-car, difficulties to synchronized impact offsets between mobile trolley and car)	1. Reduce complexity by testing co-linearly and/or using moving barrier to stationary car?
2. Responsibility of more complex test may be poor (for "moving barrier-moving car")	
3. Limited number of test laboratories with capability to perform trolley - to - vehicle testing.	Investigate
4. Unknown ground and other interaction effects, especially if one vehicle stationary while the other travels at higher speed - to represent both vehicles moving.	?
5. Need to agree on a harmonized barrier face when vehicle fleet shifts downwards.	Agree to differ

2.1 Commitments

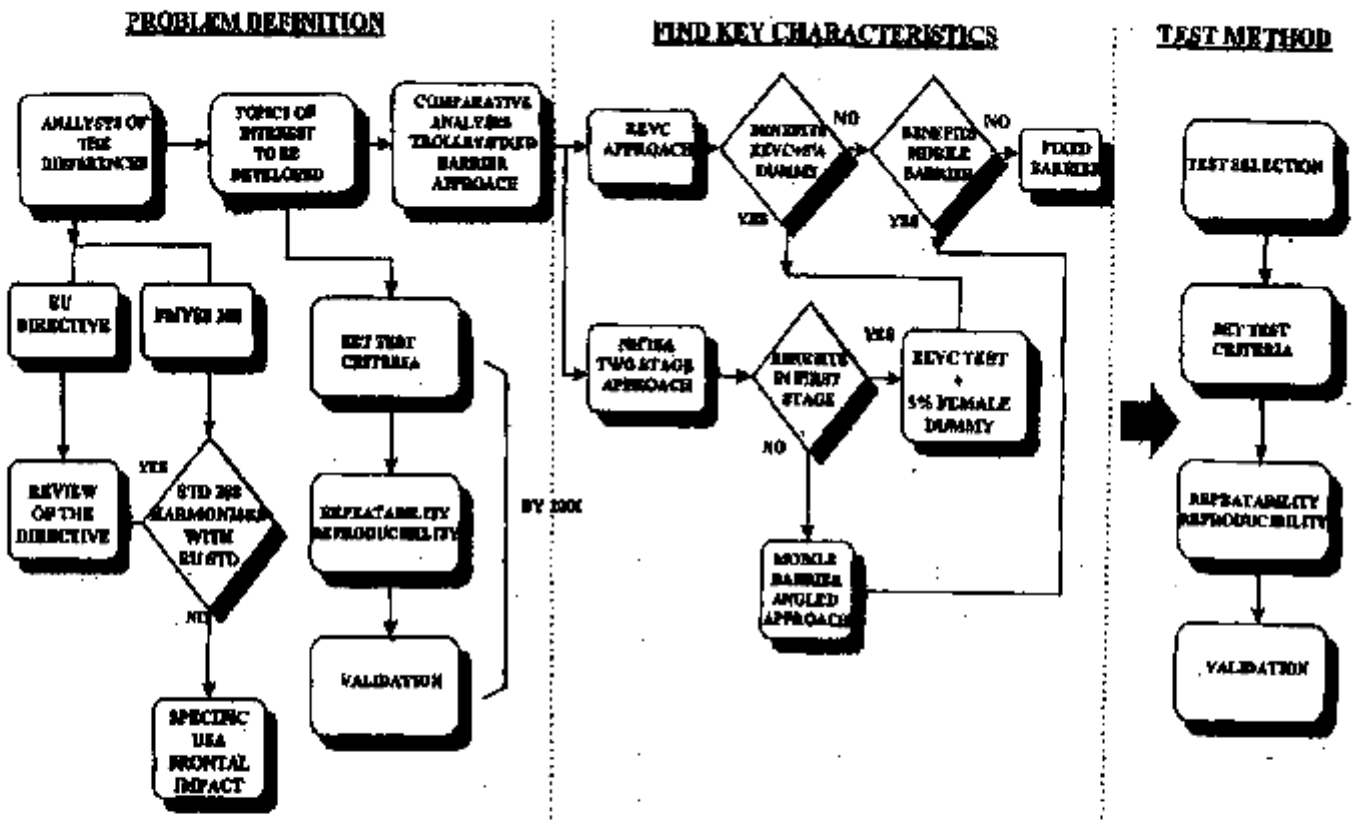
USA would concentrate on the second stage approach, which regards the Trolley-based Frontal Offset Impact Test Procedure, in case the first one will not produce any potential benefits.

SEVC will undertake the research programme in the second stage, by assessing the following items:

1. the potential benefits of using a mobile barrier
2. provide indications of possible modifications to the EC test procedure based on the accident studies for the EC, subject to EC approval to release results early.

2.2 Schedule dates

The group has not yet reviewed the deadlines of this second stage becomes premature.


PROBLEM DEFINITION
FIND KEY CHARACTERISTICS
TEST METHOD
ANALYSIS OF THE DIFFERENCES
TOPICS OF INTEREST TO BE DEVELOPED
COMPARATIVE ANALYSIS TROLLEY/SIDED BARRIER APPROACH
EU DIRECTIVE
FMVSS 208
REVIEW OF THE DIRECTIVE
STD 208 HARMONIZED WITH EU STD
YES
NO
SPECIFIC USA FRONTAL IMPACT
KEY TEST CRITERIA
REPEATABILITY REPRODUCIBILITY
VALIDATION
BY 2006
REVC APPROACH
NO
YES
FIXED BARRIER
OPTIMA TWO STAGE APPROACH
REVC TEST + 5% FEMALE DUMMY
MOVABLE BARRIER ANGLED APPROACH
TEST SELECTION
KEY TEST CRITERIA
REPEATABILITY REPRODUCIBILITY
VALIDATION